**NOMENCLATURE: COMMON POLYATOMIC IONS, ACIDS AND OXOACIDS**

Review: Common monatomic anions. Always look at charge on anion when determining the “oxidation state” (amount of positive charge on a single cation). The actual charge on the cation lets you accurately name the compound.

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| F fluoride ion | O2 oxide ion | N3 nitride ion |
| Cl chloride ion | S2 sulfide ion | P3 phosphide ion |
| Br bromide ion | Se2 selenide ion |  |
| I iodide ion | C22 carbide ion |  |
| H hydride ion |  |  |
| O2superoxide ion |  |  |

Some Common Polyatomic ions – You must memorize these, but there are patterns to assist you.

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| **Cations** | | **Anions** | | |
| **+1** |  | ** 1** | ** 2** | ** 3** |
| NH4+ ammonium |  | OH hydroxide |  |  |
| H3O+ hydronium |  | CN cyanide | CrO42 chromate |  |
| NO+ nitrosyl |  | MnO4-permanganate | Cr2O72 dichromate |  |
|  |  | NO2- nitrite | SO32 sulfite | AsO33 arsenite |
|  |  | NO3 nitrate | SO42 sulfate | AsO43 arsenate |
|  |  | ClO hypochlorite | O22- peroxide ion |  |
|  |  | ClO2 chlorite |  |  |
|  |  | ClO3 chlorate |  |  |
|  |  | ClO4 perchlorate |  |  |
|  |  | HCO3 bicarbonate or  hydrogen carbonate | CO32 carbonate |  |
|  |  | H2PO4 dihydrogen  phosphate | HPO42 hydrogen  phosphate | PO43 phosphate |
|  |  | CH3COO acetate | C2O42 oxalate |  |

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| Oxoacid | Formula | Anion | Anion Formula |
| acetic acid | CH3COOH | acetate | CH3COO- |
| carbonic acid | H2CO3 | carbonate | CO32- |
| chloric acid | HClO3 | chlorate | ClO3= |
| chlorous acid | HClO2 | chlorite | ClO2- |
| hypochlorous acid | HClO | hypochlorite | ClO- |
| iodic acid | HIO3 | iodate | IO3- |
| nitric acid | HNO3 | nitrate | NO3- |
| nitrous acid | HNO2 | nitrite | NO2- |
| perchloric acid | HClO4 | perchlorate | ClO4- |
| phosphoric acid | H3PO4 | phosphate | PO43- |
| phosphorous acid | H3PO3 | phosphite | PO33- |
| sulfuric acid | H2SO4 | sulfate | SO42- |
| sulfurous acid | H2SO3 | sulfite | SO32- |

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| **Name of Anion** | **Name of Acid** | **Examples** |
| ... ide | Hydro... ic acid | HCN(aq) cyanide → hydrocyanic acid  HBr(aq) bromide → hydrobromic acid |
| Per ... ate | Per… ic acid | HClO4 perchlorate→ perchloric acid |
| ... ate | … ic acid | HClO3 chlorate→ chloric acid  H2SO4 sulfate → sulfuric acid |
| ... ite | ... ous acid | HClO2 chlorite→ chlorous acid  H2SO3 sulfite → sulfurous acid |
| Hypo... ite | Hypo… ous acid | HClO hypochlorite→ hypochlorous acid |

The rules used to name inorganic acids are different from those rules used to name the ionic and covalent compounds. For example, HNO3 is called nitric acid, not hydrogen nitrate nor hydrogen nitrogen trioxide. How can one recognize an acid by looking at its chemical formula? An acid is a proton donor. Therefore, for the purpose of nomenclature, an acid can be viewed as a molecule with one or more protons (H+) bonded to an anion. Note that the molecule must not carry a charge. For example, HSO3 is not an acid molecule; it is an anion because it carries a  1 charge. Even though it shows acidic properties, it is named like a polyatomic anion. Also, the molecule must not contain metal atoms. For example, NaHSO3 should not be named as an acid. Instead, it should be named as an ionic compound because it consists of a Na+ cation and an HSO3anion. Thus, it is named sodium bisulfite or sodium hydrogen sulfite.

Many acids consist of protons bonded to an oxoanion (e.g., HNO3 is H+ bonded to NO3 and H2SO4 is two H+ ions bonded to an SO42ion). These acids are called **oxoacids**. To name an oxoacid, one should change the  ate or  ite suffixes of the oxoanions to  ic or  ous respectively and add the word acid at the end. For example,

HNO3 is H+ bonded to NO3(nitrate), thus it is called nitric acid.

HNO2 is H+ bonded to NO2(nitrite), thus it is called nitrous acid.

Besides the oxoacids, there are other acids in which the anions end with the suffix  ide. The names of these acids begin with hydro and end with  ic. For example, aqueous HCl is called hydrochloric acid because the anion, Cl , is named chloride.

The names of the inorganic acids are closely related to the names of the anions in the acid. The correlations among the names of the anions and the names of the acids are summarized

**Note:** The gaseous HCl, HBr, H2S, etc. do not bear the names of acids. They are named as covalent compounds. A compound that dissolves in water to form an acid is called an acid anhydride (acid without water). Only the aqueous solutions of acid anhydrides are named as acids. Therefore, HCl(g) is called hydrogen chloride while HCl(aq) is called hydrochloric acid; HCN(g) is called hydrogen cyanide while HCN(aq) is called hydrocyanic acid. The distinction in naming the anhydrides and the acids is not critical for oxoacids, because all their anhydrides are different molecules. For example, the anhydride of H2SO4 is SO3, not gaseous H2SO4. Thus H2SO4 is always called sulfuric acid, not hydrogen sulfate.